USER'S GUIDE

LSI7202CP CompactPCI Dual Channel 2 Gbit/s Fibre Channel Host Adapter

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LSI LOGIC ®

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- Laser Manufacturer
- Model #
- Serial #

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Preface

This book is the user's guide for the LSI Logic LSI7202CP CompactPCI Dual Channel 2 Gbit/s Fibre Channel Host Adapter. It includes instructions for installing this adapter with regard to cold and hot installations and provides this adapter's specifications.

Audience

This document assumes that you have some familiarity with CompactPCI computers and related support devices. The people who benefit from this book are:

- Engineers and managers who are evaluating or designing the host adapter board for possible use in a system

- End users who are installing the host adapter board into their computer

Organization

This document has the following sections:

- Chapter 1, **Installing/Extracting the LSI7202CP Host Adapter**

- Chapter 2, **LSI7202CP Host Adapter Characteristics**

- Chapter 3, **BIOS Features**

- Chapter 4, **Solaris Software Requirements**

- Appendix A, **Glossary of Terms and Abbreviations**

Conventions Used in This Manual

Notation	Example	Meaning and Use
courier typeface	# cfagdm	Names of commands and the output from the commands are shown in courier type face and enclosed in a box.
italic underscore	*attachment_point*	When an underscore appears in an italicized string next to a command, enter a user-supplied item of the type called for with no spaces.

Revision Record

Revision	Date	Remarks
0.5	11/01	First release.
0.6	12/01	Second Advance printing. Front matter includes laser safety statement. Added Section 8.
1.0	02/02	Final printing. Converted to LSI Logic format. Changes throughout.

Contents

Chapter 1
Installing/Extracting the LSI7202CP Host Adapter

This chapter describes the installation procedures for the LSI7202CP CompactPCI Dual Channel 2 Gbit/s Fibre Channel host adapter. The main topics are:

1.1 Host Adapter Installation

This section provides a general overview of the tasks needed to perform either a hot or cold installation. For the exact procedures required for your system, refer to the operating system and system documentation.

1.1.1 Cold Installation Preparation

Before shutting down the operating environment and halting the system, ensure that all significant application activity on the server has stopped. To prepare the system for a cold installation, follow these steps.

Step 1. Follow the appropriate procedures, as documented in the system's service manual, to shut down and halt the system.

Step 2. Refer to the system's documentation for the complete power down procedure and location of the power switch.

Step 3. Press the power switch on the system's status panel to power down the system.

Step 4. Verify that the system's power LED is OFF, which indicates that the system is completely powered off.

After the system has been shut down and powered off, you can safely install the card.

1.1.2 Hot Installation Preparation

Refer to your system's hardware user's manual for complete instructions regarding hot installation.

1.1.3 Installation

Review your system's documentation for the complete instructions before performing the following steps to install the LSI7202CP into your system:

Step 1. Identify the slot number where you want to insert the adapter.

Step 2. Refer to the system's documentation for instructions on how to remove the filler panel.

Step 3. Remove the filler panel from the slot you selected.

Step 4. Push on the red release button and open the LSI7202CP card's ejection lever before installing the card in the system.

Step 5. Pull back the ejection lever and slide the card into the CompactPCI slot.

Step 6. Apply even pressure at both corners of the card and push the card until it is firmly seated in the slot.

Step 7. Push the ejection lever over the sprocket toward the card and into the locked position. This locks the card into the slot.

Step 8. Use a Phillips screwdriver to tighten the captive screws inside the card's ejection lever.

Step 9. Attach the Fibre Channel cable to either Port 0 or Port 1 of the LSI7202CP. This completes the hardware installation.

Important: Check your system's documentation for any additional actions that may be required to configure the system software for the newly inserted card.

1.2 Extracting the LSI7202CP

The LSI7202CP is a component that you can extract from a hot-swap compliant system without interrupting the operation of the system. You can also extract the adapter if installing it in a cold environment after you power down the system.

You must determine whether you want to perform a cold extraction of the adapter or a hot extraction. In a cold extraction, you must shut down the system's operating system and power down the system before extracting the adapter. In a hot-swap extraction, you may be required to enter software commands before and after the extraction to detach the adapter from the system correctly.

> Note : The following procedures provide a general overview of the tasks needed to prepare for either a hot or cold extraction. For the specific procedures required for your system, refer to the documentation that shipped with your system.

1.2.1 Cold Environment Extraction

Before extracting your adapter, ensure that all significant application activity on the server has stopped. To extract the LSI7202CP, follow these steps.

Step 1. Refer to the system's documentation for the complete power down procedure and location of the power switch.

Step 2. Press the power switch to power down the system.

Step 3. Verify that the system's power LED is OFF, which indicates that the system is completely powered off.

Step 4. Extract the LSI7202CP after the system has been shut down and powered off.

1.2.2 Hot Environment Extraction

Refer to your system's hardware user's manual for complete instructions regarding hot environment extraction.

Installing/Extracting the LSI7202CP Host Adapter

Chapter 2
LSI7202CP
Host Adapter
Characteristics

This chapter provides instructions for installing and extracting the host adapter board and includes these topics:

2.1 General Description

The LSI7202CP is a CompactPCI dual channel 2 Gbit/s Fibre Channel host adapter. The following sections describe the features of and the hardware and software support for the LSI7202CP.

2.1.1 Features

The LSI7202CP adapter supports these features:

- Hot-swap CompactPCI/PCI installation and removal
- Asynchronous and synchronous transfers

2.1.2 Hardware and Software Support

The LSI7202CP supports most major software operating systems, such as Sun Solaris (2.6 and higher), Windows Server (NT 4.0, 2000, XP, .NET), Linux (RedHat, Suse, Caldera, Turbo), NetWare, UnixWare, HP-UX, and OS/2. The LSI7202CP host adapter utilizes the Fusion-MPT™ architecture for all major operating systems. Fusion-MPT architecture offers the unique feature of having a single, binary operating system driver that supports Fibre Channel devices and other bus architectures.

Before you use the LSI7202CP, make sure your system meets the specific hardware and software requirements as shown in Table 2.1.

Table 2.1   Hardware and Software Requirements

Component	Requirements
For Solaris SPARC hardware environments	
Hardware	Any Sun Microsystems computer with an available CompactPCI slot
Software	The Solaris 8 operating environment
Firmware	OpenBoot PROM, version 2.1 or greater
For Intel IA-32 or IA-64 hardware environments	
Hardware	Any Intel compatible
Software	Windows Server (NT 4.0, 2000, XP, .NET) Linux (RedHat, Suse, Caldera, Turbo) NetWare, UnixWare, HP-UX, and OS/2
Firmware	Any Intel compatible BIOS system

2.1.3 Fibre Channel Cable Assemblies

You will use one of two types of Fibre Channel cable assemblies based on your system.

- LSI7202CP-LC and LSI7202CP-LC6

  – LC optical to LC optical

  – LC optical to SC optical

- LSI7202CP-HS and LSI7202CP-HS6

  – HSSDC2 to HSSDC2

  – HSSDC2 to HSSDC

2.2 Technical Characteristics

This section provides information about the CompactPCI, PCI, and Fibre Channel interfaces on the LSI7202CP. It also includes information about the physical, electrical, and the thermal/atmospheric characteristics of the LSI7202CP.

Figure 2.1 provides a photo of the LSI7202CP.

Figure 2.1   LSI7202CP CompactPCI Host Adapter
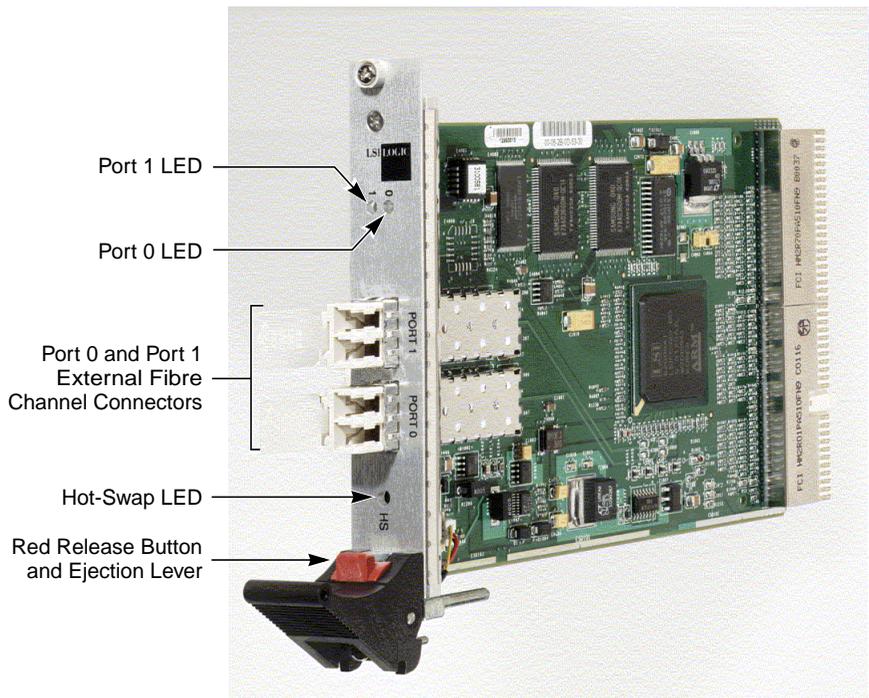
2.2.1 Bus Interfaces

This section describes the bus interfaces that the LSI7202CP supports.

2.2.1.1 CompactPCI Interface

CompactPCI is an adaptation of the Peripheral Component interconnect (PCI) Specification for industrial and/or embedded applications that

require a more robust mechanical form factor than desktop PCI. CompactPCI is electrically compatible with the PCI Specification, allowing low cost PCI components to be utilized in a mechanical form factor suited for more rugged environments. The LSI7202CP fully supports Hot Swap as defined in the *CompactPCI Hot Swap Specification, Revision 1.0*.

2.2.1.2 PCI Interface

The PCI functionality for the LSI7202CP is contained within the LSIFC929 Dual Channel Fibre Channel I/O Controller. This controller connects directly to the PCI bus and generates timing and protocol in compliance with PCI specifications. This interface provides a high-speed, standard local bus to the processor and memory subsystems in your computer.

2.2.1.3 Fibre Channel Interface

The Fibre Channel interface for the LSI7202CP is also contained within the LSIFC929 Dual Channel Fibre Channel I/O Controller. The LSIFC929 controller provides a direct interface to Fibre Channel. This controller generates timing and protocol in compliance with the Fibre Channel standard.

2.2.2 Technical Specifications

This section contains the technical specifications for the LSI7202CP.

2.2.2.1 Data Transfer Specifications

Table 2.2 lists the performance specifications for the LSI7202CP.

Table 2.2　Specifications

Feature	Specification
cPCI clock	66 MHz max
cPCI data burst transfer rate	264 Mbytes/s

2.2.2.2 Physical Characteristics

The LSI7202CP fits the 3U Eurocard form factor of 160.00 mm x 100.00 mm, as defined in the *CompactPCI Specification, Revision 3.0*. The component height on the top and bottom of the LSI7202CP follows *Revision 3.0* of the *CompactPCI Specification, Revision 2.2* of the *PCI Local Bus Specification*.

2.2.2.3 Electrical Characteristics

Table 2.3 provides the power requirements for the LSI7202CP.

Table 2.3　Power Requirements

Operating Voltage	Power
3.3 V ± 5% Operation	50.0 mW
5.0 V ± 5% Operation	7.75 W

2.2.2.4 Thermal and Atmospheric Characteristics

The following parameters define the thermal and atmospheric environment for the LSI7202CP during normal operation:

- Temperature range: 0 °C to 55 °C (dry bulb)

- Relative humidity range: 5% to 90% noncondensing

- Maximum dew point temperature: 32 °C

- Airflow must be sufficient to keep the LSIFC929 heat sink temperature below 65 °C

The following parameters define the storage and transit environment for the LSI7202CP:

- Temperature range: −40 °C to +105 °C (dry bulb)

- Relative humidity range: 5% to 90% noncondensing

2.2.2.5 Electromagnetic Compliance

The design of the LSI7202CP minimizes electromagnetic emissions, susceptibility to radio frequency energy, and the effects of electrostatic discharge. The LSI7202CP carries the BSMI, CE mark, FCC Self-Certification log, Canadian Compliance Statement, VCCI, and meets the requirements of FCC Class A.

2.2.2.6 Safety Characteristics

The LSI7202CP meets or exceeds the requirements of Underwriters Laboratory (UL) flammability rating 94 V0. The LSI7202CP is also marked with the supplier's name or trademark, type, and UL flammability rating.

Chapter 3
BIOS Features

This chapter provides information pertaining to Intel BIOS and Solaris Fcode and includes these topics:

3.1 BIOS Features

A BIOS is the ROM code that is loaded by the system to facilitate booting from Fibre Channel drives. The BIOS also contains an embedded configuration manager, used to configure options provided by the firmware. The LSI Logic BIOS integrates with a standard system BIOS, extending the standard disk service routine provided through INT13h.

Two types of BIOS are available for the LSI7202CP:

- Intel BIOS for Intel-based platforms
- Fcode for Solaris SPARC platforms.

Both Intel BIOS and Fcode concurrently reside on the boards.

3.1.1 Intel BIOS

This section provides the features, description, and installation of the Intel Fibre Channel BIOS.

3.1.1.1 Intel BIOS Features

The LSI Logic FC Intel BIOS features support:

- Selection and configuration for up to 256 adapters

- Boot device selection from any four host adapters
- Automatic INT13 drive mapping for Fibre Channel drives

3.1.1.2 BIOS Overview

During the boot time initialization, the Intel BIOS determines if there are other hard disks, such as an IDE drive, already installed by the system BIOS. If there are, the Intel BIOS maps any Intel drives it finds after the drive(s) already installed. Otherwise, the Intel BIOS installs drives starting with the system boot drive. In this case, the system boots from a drive controlled by the Intel BIOS.

3.1.1.3 Intel BIOS Boot Specification (BBS)

The Intel BIOS provides support for the BIOS Boot Specification (BBS), which allows you to choose which device to boot from by selecting the priority.

To use this feature, the system BIOS must also be compatible with the BBS. If your system supports the BBS, use the system BIOS setup menu to select the boot and drive order. In the system BIOS setup, the Boot Connection Devices menu appears with a list of available boot options. Use that menu to select the device and rearrange the order. Then exit to continue the boot process.

3.1.2 Starting the Intel BIOS Configuration Utility

The LSI Logic Intel BIOS allows you to change the default configuration of your host adapters, using the embedded BIOS Configuration Utility.

When the BIOS loads, the following message appears on your monitor:

`Press Ctrl-C to start LSI Logic Configuration Utility...`

This message remains on your screen for about five seconds, giving you time to start the utility. After you press Ctrl-C, the message changes to:

`Please wait, invoking LSI Logic Configuration Utility...`

After a brief pause, your computer monitor displays the Main menu of the BIOS Configuration Utility.

> Note: Not all devices detected by the Configuration Utility can be controlled by the BIOS. Devices such as tape drives and scanners require that a device driver specific to that peripheral be loaded. The BIOS Configuration Utility does allow parameters to be modified for these devices.

3.1.3 Using the Intel BIOS Configuration Utility

This section provides the menu formats and user inputs available to inform users about this utility prior to running it. All BIOS Configuration Utility screens that display various menus are partitioned into fixed areas. This area provides static general help text information.

3.1.3.1 Main Menu

When you invoke the LSI Logic Intel BIOS Configuration Utility, the Main menu appears. This screen displays a scrolling list of up to 256 host adapters in the system and information about each of them.

To select an adapter, use only the arrow keys and enter key. Then, press **Enter** to view and modify the selected adapter's properties (and to gain access to the attached devices). After selecting an adapter and pressing **Enter**, the FC Link bus is scanned and the Adapter Properties screen appears.

On the Main menu, two selections are the Boot Adapter List and Global Properties menus.

Boot Adapter List allows selection and ordering of boot adapters. Refer to Section 3.1.3.5, "Boot Adapter List Menu," page 3-5 for more detailed information.

Global Properties allows changes to global scope settings. Refer to Section 3.1.3.6, "Global Properties Menu," page 3-5 for more detailed information.

Only adapters with LSI Logic Control enabled can be accessed.

3.1.3.2 Adapter Properties Menu

The Adapter Properties menu allows you to view and modify adapter settings. It also provides access to an adapter's device settings. To

display this menu, select a device under Adapter field on the Main menu and press **Enter**.

3.1.3.3 Persistent IDs Menu

The Persistent ID screen is used to review the automatic mapping between a drive WorldWide Name and its assigned logical SCSI bus and target ID. You can also use this screen to force a drive to a specific logical Target ID.

Selecting **Add WWN** at an unused location clears out the associated WWN/DID field and allows you to enter the first 16 characters of the WWN. Pressing <**Enter**> afterwards allows the last 16 characters to be entered. The CU automatically adds any leading zeros if necessary. If you make an entry by mistake, select **Erase** on the appropriate line to remove the entry.

Logical ID selection defaults to be the lowest ID available. This can be changed by using the <+> or <-> keys to cycle the numbers. The Bus field always defaults to 0 and cannot be changed. It is displayed in the case where an outside utility reserved a different number.

Next Page and Previous Page options are provided on the persistent ID screens, through the F2 key, which moves the screen forward or back by 16 entries. However, the CU requires that any modifications to the current page be stored before new entries may be viewed or modified. A confirmation window pops up asking to store or discard changes if needed.

3.1.3.4 Device Properties Menu

The Device Properties menu allows you to view and update individual device settings for an adapter.

Note: The number of fields on the menu requires that you scroll left/right to view all of the information. When accessing this menu, use the Home/End keys to scroll to columns currently not displayed. The scroll indicator on the bottom of the menu shows where the cursor is relative to the first and last columns.

3.1.3.5 Boot Adapter List Menu

The Boot Adapter List menu specifies the order in which adapters boot when more than one LSI Logic host adapter is in a system. You can select up to four of the total adapters in a system as bootable; however, you can use only one of the four "active" adapters to control a Boot Volume.

To select this menu:

1. Press **F2** while on the Main menu to move the cursor to the menu area.
2. Move the cursor to Boot Adapter List with the arrow keys.
3. Press **Enter**.

You can add or delete adapters using this menu. To add an adapter to the boot list, press the **Insert** key while on the Boot Adapter List. Use the arrow keys to select the desired adapter and press **Enter** to add it to the end of the Boot Adapter List.

To remove an adapter from the boot list, press the **Delete** key while on the desired adapter in the Boot Adapter List. You can also change the boot order by using the "**+**" or "**−**" keys. For example, place the cursor on the adapter that you want to change, and use the "**+**" or "**−**" key to raise or lower the boot order.

3.1.3.6 Global Properties Menu

The Global Properties menu allows you to pause if an alert message has been displayed, to view display boot information, and to set display and video modes.

3.1.4 Exiting the Intel BIOS Configuration Utility

The Exit menu for the Intel BIOS Configuration Utility is used for all five of the menus listed above. However, the available functionality is different for the Main menu and the four subordinate menus.

To exit from the Adapter Properties, Device Properties, Boot Adapter List, or Global Properties menus, use these exit options:

Cancel exit   This option returns you to the previous menu.

Save changes then This option implements any changes you made on the
exit this menu   previous menu and returns you to the Main menu.

Discard changes   This option restores the default settings and returns
then exit this menu you to the Main menu.

To exit from the Main menu, use these exit options:

Cancel exit   This returns you to the Main menu.

Exit the Configuration This option exits the configuration and automatically
Utility   reboots your system.

Important: If you reboot the system without properly exiting from this utility, some changes may not take effect.

3.1.5 Fcode

LSI Logic Solaris-capable Fusion-MPT host adapters have Fcode resident on board, allowing operation under Sun's openboot console. All basic functionality is available at openboot, including the ability to display devices connected to the adapter, and boot devices on the adapter.

3.1.5.1 Fcode Features

The LSI Logic FC Fcode features support for:

- Solaris Sparc 2.6, 2.7, and Solaris 8 Open Firmware environments

- Root Boot device selection from any target device

- Standard command line interface, with help query

- Configuration options and selection for each host adapter

3.1.5.2 Identifying the Fibre Channel Disks

The `probe-scsi-all` command is used to identify the Fibre Channel devices on the Fusion-MPT adapter.

To show all disks available from the openboot prompt, use the **probe-scsi-all** command. Note that this command is used whether the disks are Fibre Channel or SCSI; all disks available on all Fusion-MPT devices are displayed.

```
ok probe-scsi-all

/pci@8,600000/SUNW,qlc@4
LiD HA LUN ---Port WWN--- ----Disk description----
1  1  0  2100002037e4d65b SEAGATE ST318304FSUN18G 0726

/pci@8,700000/IntraServer-Ultra160,scsi@3,1
/pci@8,700000/IntraServer-Ultra160,scsi@3
Target 0
   Unit 0   Disk   IBM   DDRS-34560D   DC1B

/pci@8,700000/IntraServer,fc@2
MPT Version 1.00, Firmware Version 1.02.00
Target 0
   Unit 0   Disk   SEAGATE ST39173FC   6615
   WWN 2100002037109d76  Port ID d9
Target 1
   Unit 0   Disk   SEAGATE ST39173FC   6258
   WWN 210000203710565a  Port ID 17
Target 2
   Unit 0   Disk   SEAGATE ST39173FC   6258
   WWN 2100002037105212  Port ID 1
Target 3
   Unit 0   Disk   SEAGATE ST39173FC   6258
   WWN 2100002037103da8  Port ID 26
Target 4
   Unit 0   Disk   SEAGATE ST39173FC   6258
   WWN 210000203710324a  Port ID 73
/pci@8,700000/scsi@6
Target 6
   Unit 0 Removable Read Only device PLEXTOR CD-ROM PX-20TS
```

If the Fibre Channel devices on your LSI Logic adapter are not identified by your system, check the following:

1. Is the Fibre Channel enclosure powered ON?

2. Does the LED on the adapter indicate LINK? (note that LINK is only valid after the device is probed)

3. Does the LED on the switch or remote enclosure indicate LINK?

4. Does the LINK-SPEED parameter selected by the adapter match that of the bus (1G, 2G, or Auto)?

If you do not see disks, the following additional debug information may help to identify the problem.

3.1.5.3 Verifying Correct Installation

Use this procedure to verify installation of your Fusion-MPT adapter in the system:

Step 1. Power on the system.

Step 2. When the banner displays, press the **stop-A** keys to interrupt the boot process and stop at the **ok** prompt.

Step 3. Use the **show-devs** command to list the system devices. You should see an output similar to the following:

```
ok show-devs

/SUNW,UltraSPARC-III@0,0
/virtual-memory
/memory@m0,0
/aliases
/options
/openprom
/chosen
/packages
/upa@8,480000/SUNW,ffb@0,0
...
/pci@8,700000/IntraServer,fc@2
/pci@8,700000/IntraServer,fc@1,1
/pci@8,700000/IntraServer,fc@1
...
/pci@8,700000/IntraServer,fc@2/disk
/pci@8,700000/IntraServer,fc@2/tape
/pci@8,700000/IntraServer,fc@1,1/disk
/pci@8,700000/IntraServer,fc@1,1/tape
/pci@8,700000/IntraServer,fc@1/disk
/pci@8,700000/IntraServer,fc@1/tape
/pci@8,700000/scsi@6,1/tape
/pci@8,700000/scsi@6,1/disk
```

```
ok
```

- `/pci@8,700000/IntraServer,fc@1`
  identifies the *first* Fibre Channel interface on an LSI Logic LSIFC929-based adapter

- `/pci@8,700000/IntraServer,fc@1,1`
  identifies the *second* Fibre Channel interface on an LSI Logic LSIFC929-based adapter

- An LSI Logic LSIFC909-based adapter shows only one such Fibre Channel device

  Note: The above are examples. The output of **show-devs** may vary depending on your system and configuration. Use the corresponding entries on your system, not the ones given here.

If these devices are not listed, check that the adapter is correctly installed, and re-seat the adapter if necessary.

3.1.5.4 Adapter-Specific Settings

In certain circumstances, the advanced user may want to change settings for an individual adapter or port, without affecting the other adapters in the system. Specific examples of such settings are Fibre Channel bus speed, host adapter ID (SCSI only: Not Applicable to Fibre Channel), and Interrupt Coalescing.

To select a specific Fusion-MPT adapter as the current adapter, use the **select** command. Selecting a port or adapter will bring the port online, and will allow you to show or set certain adapter specific parameters.

You should use caution while issuing the following commands, as certain commands could render the bus unusable (such as forcing 1 Gbit/s operation on a 2 Gbit/s Fibre Channel loop).

select – Use the **select** openboot command to select the adapter entry. This will open the port to bring the port online.

```
ok select /pci@8,700000/IntraServer,fc@1
```

.properties – Use **.properties** to show the adapter properties.

```
ok .properties
```

BIOS Features   *3-9*

```
firmware-version    1.02.00
mpt-version         1.00
scsi-initiator-id   00 00 00 0f
assigned-addresses  81001010 00000000 00000700 00000000 00000100
                    83001014 00000000 001a0000 00000000 00020000
                    8300101c 00000000 00190000 00000000 00010000
                    82001030 00000000 02000000 00000000 00100000
compatible          70 63 69 31 33 65 39 2c 36 32 31 00 70 63 69 31
model               LSI,929
reg                 00001000 00000000 00000000 00000000 00000000
                    01001010 00000000 00000000 00000000 00000100
                    03001014 00000000 00000000 00000000 00020000
                    0300101c 00000000 00000000 00000000 00010000
                    02001030 00000000 00000000 00000000 00100000
version             1.00.16
device_type         scsi-2
name                IntraServer,fc
fcode-rom-offset    00000000
66mhz-capable
devsel-speed        00000001
class-code          00010000
interrupts          00000001
latency-timer       00000040
cache-line-size     00000010
max-latency         00000008
min-grant           0000001e
subsystem-id        00000621
subsystem-vendor-id 000013e9
revision-id         00000001
device-id           00000621
vendor-id           00001000
```

show-children – While you have the adapter or port selected, to display the devices currently connected to this adapter, use the **show-children** command:

Select the port or adapter shown (use the port name your system assigns):

ok select /pci@8,700000/IntraServer,fc@1

ok show-children

```
MPT Version 1.00, Firmware Version 1.02.00

Link is ready, port is online
   WWN 100000a0b8040353  Port ID ef

Target 0
   Unit 0    Disk    SEAGATE ST39173FC      6615
   WWN 2100002037109d76  Port ID d9

Target 1
   Unit 0    Disk    SEAGATE ST39173FC      6258
   WWN 210000203710565a  Port ID 17

Target 2
   Unit 0    Disk    SEAGATE ST39173FC      6258
```

```
         WWN 2100002037105212  Port ID 1
Target 3
    Unit 0   Disk   SEAGATE ST39173FC      6258
    WWN 2100002037103da8  Port ID 26
Target 4
    Unit 0   Disk   SEAGATE ST39173FC      6258
    WWN 210000203710324a  Port ID 73
```

3.1.5.5 Interrupt Coalescing

Interrupt coalescing allows the firmware on the Fusion-MPT device to group I/Os together to minimize the overhead to the host system. This feature can result in significant performance benefits when I/Os are rapidly coming into the adapter, as is the case while performing small sequential reads from a disk.

LSI Logic has performed significant testing under multiple I/O conditions, and has determined that the interrupt coalescence values that are beneficial over a wide range of I/O conditions are a depth of 4, with a timeout of 160 microseconds. This means that the host is interrupted only once for four I/Os processed by the chip, unless 160 microseconds has passed since the host was last interrupted.

Although LSI Logic has determined that these settings are optimal for a wide variety of situations, your own I/O load may benefit from a deeper queue or a longer timeout. LSI Logic provides a mechanism to modify these values and write them to the nonvolatile EEPROM on the adapter.

Select the port or adapter shown (use the port name your system assigns):

ok select /pci@8,700000/IntraServer,fc@1

ok show-interrupt-coalescing

```
Interrupt coalescing timeout is a0 (160 decimal) microseconds
Interrupt coalescing depth is 4 (4 decimal)
```

ok set-interrupt-coalescing <- *command with no arguments prints help*

```
usage is <timeout><depth> set-interrupt-coalescing
```

ok 100 8 set-interrupt-coalescing

```
Interrupt coalescing timeout selected is 100 (256 decimal) microseconds
Interrupt coalescing depth selected is 8 (8 decimal)
```

```
Interrupt coalescing has been set
Change will take effect after system reset
```

> Note: The system must be power cycled for the changes to take
> effect. It is not sufficient to execute the **reset-all** command.

3.1.5.6 Set Fibre Channel Link Speed

There are two modes of operation for Fibre Channel, 1 Gbit/s and
2 Gbit/s. It is important to match the speed of the port with the speed of
the loop or fabric to which the port is attached.

LSI Logic has implemented auto-negotiation on the 2 Gbit/s capable
Fusion-MP devices. If you are experiencing difficulty with the auto
negotiate algorithm on your fabric or loop, or you wish to manually set or
show the link speed for the adapter, use the following procedure:

Select the port or adapter shown (use the port name your system assigns):

ok select /pci@8,700000/IntraServer,fc@1

ok show-link-speed

```
Link speed selected is 1 Gbaud
Current link speed is 1 Gbaud
```

ok set-link-speed <- *command with no arguments prints help*

```
usage is <link-speed> set-link-speed
```

ok a set-link-speed

```
Link speed selected is autobaud
Link speed has been set
Change will take effect after system power cycle
```

ok show-link-speed

```
Link speed selected is autobaud
Current link speed is 1 Gbaud
```

> Note: The system must be power cycled for the changes to take
> effect. It is not sufficient to execute the **reset-all** command.

3.1.5.7 Persistent Device Naming

Under certain configurations, such as when the Fibre Channel disk is the boot device of a system, it may be preferable to lock a target disk to a unit number. LSI Logic Fcode allows the system administrator to write a nonvolatile map of IDs to the Fibre Channel controller.

The following is an example of how to map devices in the persistent device table.

Select the controller you want to modify, as follows:

ok show-disks

```
a) /pci@1f,0/pci@1/IntraServer,fc@2/disk
b) /pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1/disk
c) /pci@1f,0/pci@1,1/ide@3/cdrom
d) /pci@1f,0/pci@1,1/ide@3/disk
e) /pci@1f,0/pci@1,1/ebus@1/fdthree@14,3203f0
q) NO SELECTION
```

```
Enter Selection, q to quit: a
/pci@1f,0/pci@1/IntraServer,fc@2/disk has been selected.
```

```
Type ^Y ( Control-Y ) to insert it in the command line.
e.g. ok nvalias mydev ^Y for creating devalias mydev for
/pci@1f,0/pci@1/IntraServer,fc@2/disk
```

ok select /pci@1f,0/pci@1/IntraServer,fc@2
ok show-children

```
MPT Firmware Version 1.00
```

```
Target 0
    Unit 0      Disk   SEAGATE ST39173FC    6615
    WWN 200000203710c4e8  PortID a3
```

ok set-persistent *<- command with no arguments prints help*

```
usage is <current-target-id> <persistent-target-id> set-persistent
```

ok 0 0 set-persistent

ok show-persistent

```
Entry 1  WWN 200000203710c4e8  Target 0
```

To clear an entry in the persistent device map, use the clear-persistent command:

```
ok  1 clear-persistent
```

```
Entry 1 has been cleared
```

```
ok show-persistent
```

```
ok
```

Entry 1 has been deleted from the table, and the table is now empty.

3.2 Troubleshooting

The LSI Logic Intel BIOS Configuration Utility is a powerful tool. If, while using it, you somehow disable all of your controllers, pressing Ctrl-A or Ctrl-E after memory initialization during reboot allows you to re-enable and reconfigure.

These messages may appear during the boot process:

- Adapter removed from boot order, parameters will be updated accordingly! appears when an adapter is removed from the system or relocated behind a PCI bridge. This message is for information only, and no further user action is required.

- Configuration data invalid, saving default configuration! appears if none of the information in NonVolatile Random Access Memory (NVRAM) is valid. This message is for information only, and can occur when the BIOS is upgraded or when some external event has rendered the NVRAM temporarily unreadable.

- Found FC Controller not in following Boot Order List, to Add: Press Ctrl-C to start LSI Logic Configuration Utility... appears when fewer than four adapters are in the boot order and adapters exist in the system which are not in the boot order. This message is for information only, and indicates that more than four adapters exist in the system. The additional adapters will not be managed by the Configuration Utility.

Chapter 4
Solaris Software Requirements

This chapter provides device driver requirements and methods to verify the proper installation of the LSI7202CP, as well as installation instructions for the itmpt Sun SPARC Solaris driver. The chapter includes these topics:

4.1 Device Driver Software Requirements

To support the device drivers for the LSI7202CP, you must have the itmpt driver for your operating system installed.

After they are installed, the boards have device paths similar to this example:

```
/pci@8,700000/IntraServer,fc@1
```

Under these nodes, one instance of the device driver that has device nodes is evident:

```
/pci@8,700000/IntraServer,fc@1,1/disk
/pci@8,700000/IntraServer,fc@1,1/tape
```

4.2 Verifying the Installation

To verify the proper installation of the LSI7202CP before booting the operating system, follow one of these two methods.

4.2.1 nonvolatileMethod 1 – Using the `show-devs` Command

Step 1.   Access the `ok` prompt.

Type the `show-devs` command:

Step 2.   The system displays output similar to this:

```
ok show-devs

/SUNW,UltraSPARC-III@0,0
/virtual-memory
/memory@m0,0
/aliases
/options
/openprom
/chosen
/packages
/upa@8,480000/SUNW,ffb@0,0
...
/pci@8,700000/IntraServer,fc@2
/pci@8,700000/IntraServer,fc@1,1
/pci@8,700000/IntraServer,fc@1
...
/pci@8,700000/IntraServer,fc@2/disk
/pci@8,700000/IntraServer,fc@2/tape
/pci@8,700000/IntraServer,fc@1,1/disk
/pci@8,700000/IntraServer,fc@1,1/tape
/pci@8,700000/IntraServer,fc@1/disk
/pci@8,700000/IntraServer,fc@1/tape
/pci@8,700000/scsi@6,1/tape
/pci@8,700000/scsi@6,1/disk

ok
```

- `/pci@8,700000/IntraServer,fc@1`
  identifies the *first* Fibre Channel interface on an LSI Logic LSIFC929-based adapter.

- `/pci@8,700000/IntraServer,fc@1,1`
  identifies the *second* Fibre Channel interface on an LSI Logic LSIFC929-based adapter

  Note: The above are examples. The output of **show-devs** may vary depending on your system and configuration. Use the corresponding entries on your system, not the ones given here.

If these devices are not listed, check that the adapter is correctly installed, and re-seat the adapter if necessary.

4.2.2 Method 2 - Using the `probe-scsi-all` Command

Step 1.   Access the `ok` prompt.

Type the `probe-scsi-all` command:

Step 2.   The system then displays output similar to this:

ok probe-scsi-all

```
/pci@8,600000/SUNW,qlc@4

LiD HA LUN ---Port WWN--- ----Disk description----

1  1  0  2100002037e4d65b SEAGATE ST318304FSUN18G 0726


/pci@8,700000/IntraServer-Ultra160,scsi@3,1
/pci@8,700000/IntraServer-Ultra160,scsi@3

Target 0
   Unit 0   Disk   IBM    DDRS-34560D    DC1B

/pci@8,700000/IntraServer,fc@2

MPT Version 1.00, Firmware Version 1.02.00

Target 0
   Unit 0   Disk   SEAGATE ST39173FC    6615
   WWN 2100002037109d76  Port ID d9
Target 1
   Unit 0   Disk   SEAGATE ST39173FC    6258
   WWN 210000203710565a  Port ID 17
Target 2
   Unit 0   Disk   SEAGATE ST39173FC    6258
   WWN 2100002037105212  Port ID 1
Target 3
   Unit 0   Disk   SEAGATE ST39173FC    6258
   WWN 2100002037103da8  Port ID 26
Target 4
   Unit 0   Disk   SEAGATE ST39173FC    6258
   WWN 210000203710324a  Port ID 73
/pci@8,700000/scsi@6

Target 6
   Unit 0 Removable Read Only device PLEXTOR CD-ROM PX-20TS
```

If the Fibre Channel disks on your LSI Logic adapter are not identified by your system, check the following:

1. Is the Fibre Channel enclosure powered ON?

2. Does the LED on the adapter indicate LINK? (note that LINK is only valid after the device is probed)

3. Does the LED on the switch or remote enclosure indicate LINK?

4. Does the LINK-SPEED parameter selected by the adapter match that of the bus (1G, 2G, or Auto)?

If you do not see disks, the following additional debug information may help to identify the problem.

4.3 itmpt Device Driver

The LSI Logic itmpt driver is designed to Sun Microsystems SCSA specifications for device drivers. This driver allows connection of devices to LSI Logic adapter cards on PCI-based machines. Refer to Section 4.3.1, "Installing the itmpt Sun SPARC Solaris Driver," for information on installing the itmpt device driver.

4.3.1 Installing the itmpt Sun SPARC Solaris Driver

The LSI Logic LSI7202CP uses the itmpt driver for Solaris systems. This driver is included with your adapter kit. The following sections describe the procedures to install the itmpt driver on Solaris based systems.

Note: If you plan to use an LSI Logic adapter for your *system disk*, you *must* use the installation procedure as described in Section 4.3.1.2, "Network Installation Procedure," to load the device driver during installation.

4.3.1.1 Existing System Installation

These instructions provide details on how to install the LSI Logic itmpt driver to an existing Solaris operating system.

Note: You must be logged on as root to perform the installation.

Floppy Disk Install – If you received the drivers on a floppy diskette, follow these steps:

Step 1.   Place the diskette in the floppy drive and execute the `volcheck` command to ensure the system sees the floppy.

Step 2.   Execute the `pkgadd` procedure to add the itmpt driver to the operating system.

Example: `pkgadd -d floppy/floppy0`

You will see the display on the screen as shown in and .

Figure 4.1   pkgadd Procedure

```
The following packages are available:

1 TImpt LSI Logic/IntraServer FusionMPT(tm)
Fibrechannel/SCSI drivers

               (sparc) itmpt kit version 1.1

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]: 1

Processing package instance <ITImpt> from
</floppy/intraserver>

LSI Logic/IntraServer FusionMPT(tm) Fibrechannel/SCSI
drivers (sparc) itmpt kit version 1.1

IntraServer Technology, Inc / LSI Logic

Using </> as the package base directory.

## Processing package information.
## Processing system information.

2 package pathnames are already properly installed.

## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.
```

Figure 4.2   Completing Floppy Disk Installation

```
This package contains scripts which will be executed with
superuser permission during the process of installing this
package.

Do you want to continue with the installation of <ITImpt>
[y,n,?] y

Installing LSI Logic/IntraServer FusionMPT(tm)
Fibrechannel/SCSI drivers as <ITImpt>

## Installing part 1 of 1.
/kernel/drv/itmpt
/kernel/drv/itmpt.conf

[ verifying class <none> ]

## Executing postinstall script.
installing /kernel/drv/sparcv9/itmpt

Installation of <ITImpt> was successful.
```

Step 3.   The itmpt device driver is now installed. Reboot the machine to reconfigure the system and to recognize the new devices.

Distribution File Install – If you received the drivers in an itmpt_install.tar.Z file, follow these steps:

Step 1.   Uncompress and untar the itmpt_install.tar.Z file by typing the following commands to create a directory named install:

    uncompress itmpt_install.tar.Z

    tar -xvf itmpt_install.tar

    cd install

Step 2.   Execute the **pkgadd** process as described in the previous section to add the itmpt driver to the operating system:

   Note: If you change the disk drive configuration of your machine, it may be necessary to issue the command:

    touch /reconfigure

    and then reboot the system to allow the system to detect and correctly install your new disks.

4.3.1.2 Network Installation Procedure

If you are using your LSI Logic adapter to support your Sparc Solaris system disk, you must install the Solaris operating system using a network install. This section describes a complete installation of the Solaris operating system to a client system using LSI Logic adapters for the system disk. The method described in this section allows you to install the LSI Logic itmpt driver onto a network boot kit, making it available during the Sparc installation process.

If you are simply installing an LSI Logic adapter as an additional storage adapter in an existing system, use the driver installation procedure described in the "Distribution File Install" portion of Section 4.3.1.1, "Existing System Installation."

Setting up a Boot/Install Server – Refer to the "Preparing to Install Solaris Software Over the Network," section of the *Solaris Advanced Installation Guide*, available at http://docs.sun.com.

The basic steps to set up a boot and install server are as follows:

Step 1.   Insert the Solaris distribution CD in the boot/install server's CD-ROM drive.

Step 2.   Change your directory to the Tools area on the distribution CD:

`cd /cdrom/cdrom0/Solaris_2.8/Tools`

Step 3.   Use the setup_install_server script to copy the boot and installation files to the boot/install server:

`./setup_install_server /export/home/install`

Installing the itmpt Driver on the Boot/Install Server – After you have set up the network boot and install server, follow these steps to run the `install.sh` script, using the –n parameter to copy the driver kit to the boot server's boot files:

Step 1.   Place the diskette in the floppy drive and execute the `volcheck` command to ensure the system sees the floppy.

Step 2.   Change the directory to the root of the floppy:

`cd /floppy/floppy0`

Step 3.   Execute the `install.sh` shell script to add the itmpt driver to the boot installation area:

```
./install.sh -n /export/home/install/Solaris_2.8
```

Notes: For Solaris 2.7 boot files, the installation directory is /export/home/install/Solaris_2.7.

For Solaris 2.6 boot files, the installation directory is /export/home/install/Solaris_2.6.

You can safely ignore the message: "major number maximum based on server, not client."

Running the **install.sh** script this way copies and installs the LSI Logic drivers into the Tools/Boot/ area of the boot files and allows LSI Logic adapters to be booted for installation using the bootserver.

Adding Clients to Your Boot/Install Server – For each machine that boots into the boot/install server, follow these steps to add a client entry on the boot/install server:

Step 1. Change the directory to the boot/install kit:

```
cd /export/home/install/Solaris_2.8/Tools
```

Step 2. Use the add_install_client script to add the client machine

```
./add_install_client -i ipaddr
             -e ethernetid client_name platform_group
```

Where:

ipaddr	is the tcp/ip address of the client
ethernetid	is the ethernet hardware (mac) address of the client
client_name	is the client's system name
platform_group	is the client's vendor defined hardware group

Example: **./add_install_client -i 192.168.103.124 -e 00:08:26:02:25:34 sunsys sun4u**

Note: You can obtain the platform_group from a machine of the same type as the target client using the **uname -m** command.

Booting the Client Using the itmpt FC Driver – Now you can begin the installation of the Solaris operating system to the client target

machine using the boot and install server. On the client machine, boot the network install kit you created in the preceding steps as follows:

```
ok boot net -v
```

Important: Choose "Manual Reboot" rather than "Auto Reboot" during the installation of Solaris on the target machine. If you choose "Auto Reboot", you will not have the opportunity to complete the installation of the LSI Logic drivers and your system will fail to boot.

After the installation is complete and the system is waiting to be manually rebooted, proceed to a console window and run the following script:

```
/sbin/itmptinst
```

This script copies and installs the drivers from the boot server to the newly created Solaris installation. After this script is run, the LSI Logic device driver installation is complete and the system can be rebooted.

Notes: You can safely ignore the message: "major number maximum based on server, not client."

Your Sun machine will prompt you to allow power saving automatic shutdown. You must answer *no* to this question if you are using the LSI Logic adapter to support your boot disk.

If you change the disk drive configuration of your machine, it may be necessary to issue the command:

```
touch /reconfigure
```

and then reboot the system to allow it to detect and correctly install your new disks.

4.3.1.3 Troubleshooting the itmpt Device Driver

Table 4.1 lists some potential error messages. In the message descriptions below <n> is replaced by a number that the operating

system assigns. This number helps to identify the bus that is reporting the error.

Table 4.1   Error Messages

Error Messages	Explanation
itmpt<n>: This hardware not supported by this driver.	itmpt has been told to control an MPT device that is made by a manufacturer other than LSI Logic/IntraServer. This adapter requires a special driver provided by that manufacturer. Please contact the manufacturer for assistance.
itmpt<n>: Failed to map device registers.	itmpt was unable to access the hardware registers necessary for operation. The operating system did not properly configure the PCI device. Make sure your adapter has LSI Logic Fcode, and that the adapter is working correctly at the SUN Open Boot PROM (OBP) prompt.
itmpt<n>: Hardware not properly enabled by system, cmd=xxxxh.	The system has not properly enabled the configuration resources that itmpt needs in order to use this hardware. The cmd=xxxxh value must be reported to LSI Logic technical support.
itmpt<n>: Could not allocate memory to read configuration data.	The driver was unable to allocate memory required to process the configuration data. This means that the configuration was not properly determined. To fix this, you may need to manually configure the driver using the itmpt.conf file.
itmpt<n>: Unable to make reset notification callbacks.	The itmpt was unable to notify the target device driver of a bus reset. The target driver may start to malfunction.
itmpt<n>: ddi_dma_unbind_handle: failed	The operating system failed to respond to the named routine in a known manner. This is a fatal error that is not recoverable. Please report this error to technical support.
itmpt<n>: ddi_dma_numwin() failed.	–
itmpt<n>: ddi_dma_getwin() failed.	–
itmpt<n>: ddi_dma_alloc_handle: xxh unknown/impossible.	–
itmpt<n>: ddi_dma_buf_bind_handle: DDI_DMA_INUSE impossible.	–
itmpt<n>: ddi_dma_buf_bind_handle: xxh unknown/impossible.	–
itmpt<n>: No KeyROM found. Hardware contains no valid license.	The adapter is not a valid LSI Logic adapter licensed for use with Solaris systems.

Table 4.1   Error Messages (Cont.)

Error Messages	Explanation
itmpt<n>: Hi-level interrupts not supported.	The adapter is in a slot that cannot be used with this driver. Try moving the adapter to a different PCI slot.
itmpt<n>: Device in a slave-only slot and is unusable.	–
itmpt<n>: Failed to attach. This adapter will not be installed.	Because of one of the previous two errors, this adapter could not be "attached" to the I/O subsystem and is not accessible. See the previous error message and solve that problem.
itmpt<n>: Unable to obtain soft state structure.	The driver was unable to initialize a required data structure and therefore did not load. Please call technical support.
itmpt<n>: Failed to attach interrupt handler.	The driver was unable to initialize the interrupt handler as required. Call technical support.
itmpt<n>: The adapter is malfunctioning or is of an unknown type.	The driver is not able to communicate with the hardware. You may need to update your driver or your hardware.
itmpt<n>: The adapter is malfunctioning.	–
itmpt<n>: Failed to create minor node required for DMI interface.	The driver was unable to create an entry point for the DMI device driver. If you are not using the DMI device driver, then you may safely ignore this message.
itmpt<n>: Could not attach to the SCSI subsystem.	The driver was unable to communicate with the SCSI/FC device driver that is part of the operating system. You may need to update your driver.
itmpt<n>: Failed to allocate memory.	The driver was unable to allocate the memory needed during initialization. You may have run out of available memory.
itmpt<n>: Unbind failed!	The driver had a problem when attempting to unload itself. This is a fatal error.

Solaris Software Requirements

Appendix A
Glossary of Terms and Abbreviations

8B/10B	A data encoding scheme developed by IBM, translating byte wide data to an encoded 10-bit format.
ANSI	American National Standards Institute, the coordinating organization for voluntary standards in the United States.
Arbitrated Loop Topology (FC-AL)	A FC Topology that provides a low cost solution to attach multiple ports in a loop without hubs and switches.
BER	Bit Error Rate.
Bit	A binary digit. The smallest unit of information a computer uses. The value of a bit (0 or 1) represents a two-way choice, such as on or off, true or false, and so on.
Broadcast	Sending a transmission to all N_Ports on a fabric.
Bus	A collection of unbroken signal lines across which information is transmitted from one part of a computer system to another. Connections to the bus are made using taps on the lines.
Bus Mastering	A high-performance way to transfer data. The host adapter controls the transfer of data directly to and from system memory without bothering the computer's microprocessor. This is the fastest way for multitasking operating systems to transfer data.
Byte	A unit of information consisting of eight bits.
Channel	A point-to-point link, the main task of which is to transport data from one point to another.

Configuration	Refers to the way a computer is setup; the combined hardware components (computer, monitor, keyboard, and peripheral devices) that make up a computer system; or the software settings that allow the hardware components to communicate with each other.
CPU	Central Processing Unit. The "brain" of the computer that performs the actual computations. The term Microprocessor Unit (MPU) is also used.
Crosspoint-Switched Topology (FC-XS)	Highest performance FC fabric, providing a choice of multiple path routings between pairs of F_Ports.
DMA	Direct Memory Access. A method of moving data from a storage device directly to RAM, without using the CPU's resources.
DMA Bus Master	A feature that allows a peripheral to control the flow of data to and from system memory by blocks, as opposed to PIO (Programmed I/O) where the processor is in control and the flow is by byte.
Device Driver	A program that allows a microprocessor (through the operating system) to direct the operation of a peripheral device.
EEPROM	Electronically Erasable Programmable Read Only Memory. A memory chip typically used to store configuration information.
EISA	Extended Industry Standard Architecture. An extension of the 16-bit ISA bus standard. It allows devices to perform 32-bit data transfers.
Exchange	A term that refers to one of the FC "building blocks", composed of one or more nonconcurrent sequences for a single operation.
Fabric	FC defined interconnection methodology that handles routing in FC networks.
FC-EP	The future FC Enhanced Physical standard, which will build on and is compatible with FC-PH.
FC-PH	FC Physical standard, consisting of the three lower levels; FC-0, FC-1, and FC-2.
FC-0	Lowest level of the FC Physical standard, covering the physical characteristics of the interface and media.

FC-1   Middle level of the FC-PH standard, defining the 8B/10B encoding/decoding and transmission protocol.

FC-2   Highest level of FC-PH, defining the rules for signaling protocol and describing transfer of the frame, sequence, and exchanges.

FC-3   The hierarchical level in the FC standard that provides common services, such as striping definition.

FC-4   The hierarchical level in the FC standard that specifies the mapping of Upper Layer Protocols (ULPs) to levels below.

FCC   Federal Communications Commission.

FCP   Fibre Channel Protocol.

FDDI   Fiber Distributed Data Interface. ANSI option for a Metropolitan Area Network (MAN); a network based on the use of optical fiber cable to transmit data at 100 Mbits/s.

Fibre Channel Service Protocol (FSP)   The common FC-4 level protocol for all services, transparent to the fabric type or topology.

File   A named collection of information stored on a disk.

Firmware   Software that is permanently stored in ROM. Therefore, it can be accessed during boot time.

F_Port   "Fabric" port, the access point of the fabric for physically connecting the user's N_Port.

FL_Port   An F_Port that contains arbitrated loop functions.

Frame   A linear set of transmitted bits that define a basic transport element.

Hard Disk   A disk made of metal and permanently sealed into a drive cartridge. A hard disk can store very large amounts of information.

HAL   Hardware Abstraction Layer.

HIPPI   High Performance Parallel Interface, an 800 Mbits/s interface to supercomputer networks (formerly known as high speed channel) developed by ANSI.

Host	The computer system in which a SCSI host adapter is installed. It uses the SCSI host adapter to transfer information to and from devices attached to the SCSI bus.
Host Adapter	A circuit board or integrated circuit that provides a SCSI bus connection to the computer system.
IP	Internet Protocol.
IPI	Intelligent Peripheral Interface.
ISA	Industry Standard Architecture. A type of computer bus used in most PCs. It allows devices to send and receive data up to 16 bits at a time.
Kbyte	Kilobyte. A measure of computer storage equal to 1024 bytes.
LCT	Logical Configuration Table.
LLC	Logical Link Control.
Local Bus	A way to connect peripherals directly to computer memory. It bypasses the slower ISA and EISA buses. PCI is a local bus standard.
L_Port	A FC port which supports the arbitrated loop topology.
Link_Control_ Facility	A termination card that handles the logical and physical control of the FC link for each mode of use.
Login Server	Entity within the FC fabric that receives and responds to login requests.
LUN	Logical Unit Number. An identifier, zero to seven, for a logical unit.
Mbyte	Megabyte. A measure of computer storage equal to 1024 kilobytes.
MFA	Message Frame Address.
Multicast	Refers to delivering a single transmission to multiple destination N_Ports.
NIC	Network Interface Card.
N_Port	"Node" port, a FC defined hardware entity at the node end of a link.
NL_Port	An N_Port that contains arbitrated loop functions.

Operating System   A program that organizes the internal activities of the computer and its peripheral devices. An operating system performs basic tasks such as moving data to and from devices, and managing information in memory. It also provides the user interface.

Operation   A term, defined in FC-2, that refers to one of the FC "building blocks" composed of one or more, possibly concurrent, exchanges.

Ordered Set   A FC term referring to four 10-bit characters (a combination of data and special characters) that provide low level link functions, such as frame demarcation and signaling between two ends of a link. It provides for initialization of the link after power-on and for some basic recovery actions.

Originator   A FC term referring to the initiating device.

Parity Checking   A way to verify the accuracy of data transmitted over the SCSI bus. One bit in the transfer is used to make the sum of all the 1 bits either odd or even (for odd or even parity). If the sum is not correct, an error message appears.

PCI   Peripheral Component Interconnect. A local bus specification that allows connection of peripherals directly to computer memory. It bypasses the slower ISA and EISA buses.

PDB   Packet Descriptor Block.

PIO   Programmed Input/Output. A way the CPU can transfer data to and from memory using the computer's I/O ports. PIO is usually faster than DMA, but requires CPU time.

Port   The hardware entity within a node that performs data communications over the FC link.

Port Address   Also Port Number. The address through which commands are sent to a host adapter board. This address is assigned by the PCI bus.

Port Number   See Port Address.

RAM   Random Access Memory. The computer's primary working memory in which program instructions and data are stored and are accessible to the CPU. Information can be written to and read from RAM. The contents of RAM are lost when the computer is turned off.

Responder	A FC term referring to the answering device.
RISC Core	LSIFC909 chips contain a RISC (Reduced Instruction Set Computer) processor, programmed through microcode scripts.
ROM	Read Only Memory. Memory from which information can be read but not changed. The contents of ROM are not erased when the computer is turned off.
SAN	Storage Area Network.
SCAM	SCSI Configured AutoMatically. A method to automatically allocate SCSI IDs using software when SCAM compliant SCSI devices are attached.
Scatter/Gather	A device driver feature that lets the host adapter modify a transfer data pointer so that a single host adapter transfer can access many segments of memory. This minimizes interrupts and transfer overhead.
SCB	SCSI Command Block.
SCSI	Small Computer System Interface. A specification for a high-performance peripheral bus and command set. The original standard is referred to as SCSI-1.
SCSI-2	The current SCSI specification which adds features to the original SCSI-1 standard.
SCSI ID	A way to uniquely identify each SCSI device on the SCSI bus. Each SCSI bus has eight available SCSI IDs numbered 0 through 7 (or 0 through 15 for Wide SCSI). The host adapter usually gets ID 7 giving it priority to control the bus.
Sequence	A term referring to one of the FC "building blocks", composed of one or more related frames for a single operation.
SGL	Scatter Gather List.
SNAP	SubNetwork Access Protocol.
Synchronous Data Transfer	One of the ways data is transferred over the SCSI bus. Transfers are clocked with fixed frequency pulses. This is faster than asynchronous data transfer. Synchronous data transfers are negotiated between the SCSI host adapter and each SCSI device.

System BIOS   Controls the low level POST (Power-On Self-Test), and basic operation of the CPU and computer system.

TID   Target ID.

Topology   The logical and/or physical arrangement of stations on a network.

ULP   Upper Layer Protocol.

VCCI   Voluntary Control Council for Interference.

Virtual Memory   Space on a hard disk that can be used as if it were RAM.

VPD   Vendor Product Data.

Word   A two-byte (or 16-bit) unit of information.

X3T9   A technical committee of the Accredited Standards Committee X3, titled X3T9 I/O Interfaces. It is tasked with developing standards for moving data in and out of central computers.

Index

pkgadd 4-5
power
    characteristics 2-5
    LED 1-1, 1-3

S

safety characteristics 2-6
SCO OpenServer 2-1, 2-2
SCSI 2-4
software support 2-1, 2-2
Solaris 2-1
storage environment 2-6

T

technical specifications 2-3, 2-5
    atmospheric characteristics 2-6
    electrical characteristics 2-5
    electromagnetic compliance 2-6
    heat sink 2-6
    physical characteristics 2-5
    power characteristics 2-5
    storage environment 2-6
    thermal characteristics 2-6
    transit environment 2-6
thermal characteristics 2-6
transit environment 2-6

U

UL flammability rating 2-6
UnixWare 2-1, 2-2

V

VCCI 2-6
volcheck 4-5

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